

That which is claimed is:

1. A process using perm-selective membranes for simultaneous recovery of a permeate product and a desired non-permeate product from a fluid mixture of compounds, which process comprises:

(1-a) providing a feedstream comprising a mixture of two or more compounds which when subjected to appropriately altered conditions of temperature and/or pressure exhibit a bubble point;

(1-b) providing apparatus comprising means for controlling enthalpy of selected fluids within the apparatus and one or more membrane modules each including first and second zones separated by a solid perm-selective membrane which under a suitable differential of a driving force exhibits a permeability of at least 0.1 Barrer for one of the compounds of the feedstock, each first zone having at least one inlet and outlet for flow of fluid in contact with the membrane, and contiguous with the opposite side thereof a second zone having at least one outlet for flow of permeate;

(1-c) introducing the feedstream into the first zone of one or more of the modules under conditions suitable for permeation, and thereby obtaining permeate and non-permeate streams from the modules; and

(1-d) controlling enthalpy to maintain the Membrane Efficiency Index of the non-permeate fluid within a range from about 0.5 to about 1.5.

2. The process according to claim 1 wherein the feedstream comprises a mixture of liquid and condensable vapor.

3. The process according to claim 1 wherein the feedstream comprises a mixture of organic compounds.

4. The process according to claim 3 wherein the mixture of organic compounds includes at least one isomer of an aromatic compound.

5. The process according to claim 3 wherein the mixture of organic compounds includes at least one isomer of xylene.

6. The process according to claim 5 wherein the mixture of organic compounds includes ethylbenzene.

7. A process using perm-selective membranes in multiple groups for simultaneous recovery of desired non-permeate product and purified permeate product from fluid mixtures, which process comprises:

(7-a) providing a feedstream comprising a mixture of two or more compounds which when subjected to appropriately altered conditions of temperature and/or pressure exhibit a bubble point;

(7-b) providing apparatus comprising means for controlling enthalpy of selected fluids within the apparatus and a plurality of membrane modules disposed in a first product group, a second product group, and at least one intermediate group, each module including first and second zones separated by a solid perm-selective membrane which under a suitable differential of a driving force exhibits a permeability of at least 0.1 Barrer for one of the compounds of the feedstock, each first zone having at least one inlet and outlet for flow of fluid in contact with the membrane, and contiguous with the opposite side thereof a second zone having at least one outlet for flow of permeate;

(7-c) introducing the feedstream into the first zone of one or more of the first product modules under conditions suitable for permeation, and thereby obtaining permeate and non-permeate product streams from the first product modules;

(7-d) distributing the permeate from the first product modules into the first zone of one or more of the intermediate modules under conditions suitable for permeation, and thereby obtaining permeate and non-permeate streams from the intermediate modules;

(7-e) returning at least a portion of the non-permeate from the intermediate modules into the first zone of one or more of the first product modules under conditions suitable for permeation;

(7-f) distributing the permeate from the second zones of the intermediate group of modules into the first zones of the second product group modules under conditions suitable for permeation, thereby obtaining non-permeate streams and final permeate product streams from the second product modules;

(7-g) returning at least a portion of the non-permeate from the second product modules into the first zone of one or more of the intermediate modules under conditions suitable for permeation; and

(7-h) controlling enthalpy to maintain the Membrane Efficiency Index of at least one non-permeate fluid within a range from about 0.5 to about 1.5.

8. The process according to claim 7 wherein the feedstream comprises a mixture of liquid and condensable vapor.

9. The process according to claim 7 wherein the feedstream comprises a mixture of organic compounds.

10. The process according to claim 9 wherein the mixture of organic compounds includes at least one isomer of an aromatic compound.

11. The process according to claim 9 wherein the mixture of organic compounds includes at least one isomer of xylene.

12. The process according to claim 11 wherein the mixture of organic compounds includes ethylbenzene.

13. The process according to claim 7 wherein the Membrane Efficiency Index of the non-permeate fluid from the second product modules is maintained within a range from about 0.5 to about 1.5.

14. The process according to claim 13 wherein the feedstream comprises a mixture of organic compounds that includes at least one isomer of xylene.

15. The process according to claim 14 wherein the mixture of organic compounds includes ethylbenzene.

16. The process according to claim 13 wherein the Membrane Efficiency Index of the non-permeate fluid from the first product modules is maintained within a range from about 0.5 to about 1.5.

17. The process according to claim 16 wherein the feedstream comprises a mixture of organic compounds that includes at least one isomer of xylene.

18. The process according to claim 17 wherein the mixture of organic compounds includes ethylbenzene.

19. The process according to claim 18 wherein the Membrane Efficiency Index of the non-permeate fluid from the first product modules is maintained within a range from about 0.5 to about 1.5.

5        20. A separation apparatus using perm-selective membranes in multiple groups for simultaneous recovery of desired non-permeate product and purified permeate product from fluid mixtures, which apparatus comprises:

10        a plurality of membrane modules disposed in a first product group, a second product group, and at least one intermediate group, each module including first and second zones separated by a solid perm-selective membrane which under a suitable differential of a driving force exhibits a permeability of at least 0.1 Barrer for one of the compounds of the feedstock, each first zone having at least  
15        one inlet and outlet for flow of fluid in contact with the membrane, and contiguous with the opposite side thereof a second zone having at least one outlet for flow of permeate;

20        means for distributing permeate from the first product modules into the first zone of one or more of the intermediate modules under conditions suitable for permeation, and returning non-permeate streams from the intermediate modules to inlets of the first product modules;

25        means for distributing permeate from the intermediate modules into the first zone of one or more of the second product modules under conditions suitable for permeation, and returning non-permeate streams from the second product modules to inlets of the intermediate modules; and

30        means for controlling enthalpy of selected fluids within the apparatus to maintain the Membrane Efficiency Index of at least one non-permeate fluid within a range from about 0.5 to about 1.5.